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CITRUS PRICES AND MARKET STRUCTURE

IN THE LOWER RIO GRANDE VALLEY OF TEXAS

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MARKETING RESEARCH REPORT NO. 748

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PREFACE

This is the fourth of a group of U.S. Department of Agriculture reports on market structure and performance in the Lower Rio Grande Valley. Previous reports were:

Tomato Prices and Market Structure in the Lower Rio Grande Valley of Texas. Joseph C. Podany and Raymond O. P. Farrish. Mktg. Res. Rpt. 588, Feb. 1963.

Packing Mature Green Tomatoes: Quality, Costs, and Margins in the Lower Rio Grande Valley of Texas. Robert W. Bohall, Joseph C. Podany, and Raymond O. P. Farrish. Mktg. Res. Rpt. 635, Nov. 1963.

Packing Mature Green Tomatoes: Costs, Efficiencies, and Economies of Scale in the Lower Rio Grande Valley of Texas. Robert W. Bohall, Raymond O. P. Farrish, and Joseph C. Podany. Mktg. Res. Rpt. 679, Nov. 1964.

The assistance of many citrus packers in the Lower Valley made this study possible. Without access to their detailed records, little could have been accomplished. Since information was obtained in confidence, their names cannot be revealed, but their cooperation is appreciated.

William J. Cremins of the Marketing Field Office, Fruit and Vegetable Division, Consumer and Marketing Service, U.S. Department of Agriculture, McAllen, Tex., helped in planning, initiating, and conducting the study. Ralph Winfrey, Federal Market News reporter at Weslaco, Tex., gave valuable advice on the interpretation of Market News Reports. Frank Gross, Manager of the Texas Valley Citrus Committee, Mercedes, Tex., gave valuable assistance in contacting shippers and also provided some of the information used in this report. James Dumas, Marketing Economics Division, Economic Research Service, U.S. Department of Agriculture, made a major contribution in doing the systems analysis and programming for the study.

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Washington, D. C. April 1966

SUMMARY

A 1960-61 study (based on data from 14 shipping firms and on information from the Texas Valley Citrus Committee) of the structure and pricing efficiency of the Lower Rio Grande Valley citrus market showed:

1. The market was fairly competitive. There were enough firms at the grower, shipper, and buyer levels to make it difficult to concentrate extensive bargaining power. There was evidence of entry into and exit of shipping firms from the market.

2. Pricing efficiency--the manner in which f.o.b. prices are converted to grower prices--was reasonably high during the whole season. Pricing efficiency in the short run, less than a week, was not high but appeared reasonable over periods of a week or more. The extensive practice of contracting for sale of citrus before harvest prevented adjustments in f.o.b. prices from being immediately pased on to growers.

3. Cooperatives had lower shipping-point margins(difference between f.o.b. prices and growers' prices) than independent shippers. As a result, they probably provided some incentives for other shippers to reduce margins. This effect was limited by some growers' dependence on shippers for financing and contracts made before harvest. Cooperatives also received lower average f.o.b. prices than the other firms, but were able to pay higher grower prices on early oranges than other firms.

4. There was no consistent pattern of higher average season prices for f.o.b. sales than for delivered or consigned sales. Auction prices were generally lower than prices for other terms of sale.

5. Information available to buyers and sellers on f.o.b. prices was found to cover the leading varieties and grades of citrus. The Federal Market News Service reported daily f.o.b. prices for valencia oranges, early oranges, and ruby red grapefruit. No formal source of information existed for on-tree prices.

6. In general, and despite lag because of contracting, f.o.b. blend prices and prices paid to growers follow similar trends over the season.

7. Lower Valley shippers are only moderately efficient in adjusting to changes in prices of containers.

8. Buyers tend to limit purchases to one shipper per day and to a selected group of shippers during the season.

9. Buyers tend to regard citrus of a given variety, grade, and size, packed in the same type containers, as a homogeneous product.

CITRUS PRICES AND MARKET STRUCTURE IN THE LOWER RIO GRANDE VALLEY OF TEXAS

by

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and Robert W. Bohall

Agriculture Economists
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In the Lower Rio Grande Valley (Willacy, Cameron, and Hidalgo Counties) citrus harvest starts in late September and for all practical purposes ends in June. The season usually is slightly longer for grapefruit than for oranges.

Lower Valley citrus production rose from 212,000 boxes in 1925-26 to over 28 million boxes per season between 1945-46 and 1947-48 (fig. 1). 2/ A series of disastrous freezes followed, and production declined to half a million boxes in 1951-52. The industry made a partial recovery, with output of over 10 million boxes in 1960-61, when a freeze in January 1962 caused another setback. Production in 1964-65 was 3 million boxes.

Grapefruit has been the major citrus crop in the Lower Valley, averaging nearly 80 percent of total citrus production. In the period 1944-45 to 1947-48, years of peak production, Texas supplied 39 percent of all U.S. grapefruit.

Usually, almost all of the oranges and about 60 percent of the grapefruit are marketed fresh. The fresh citrus marketed in 1960-61 was worth an estimated $19 million f.o.b. shipping point. 3/ The f.o.b. price per box of grapefruit ranged from $8.47 on September 30, 1960, to $1.94 on December 29, 1960. This decrease of 77 percent in 3 months illustrates why there is strong interest in price variations in this market.

OBJECTIVES

This report examines market structure and prices in the fresh citrus market of the Lower Rio Grande Valley. The primary aspect of pricing considered is the pricing efficiency of the market--the manner in which the market transmits prices from the f.o.b. to the grower level.

Data on number and size of firms in the Lower Valley were obtained from the offices of the Texas Valley Citrus Committee. Information on citrus purchases and sales at shipping point was obtained from a sample of 14 shipping firms handling about 78 percent of all fresh citrus shipped during the 1960-61 season. 4/

1/ Dr. Farrish transferred in April 1963 to the College of Agriculture, University of Arizona, as Extension Marketing Specialist.

2/ A box is approximately 90 pounds of oranges or 80 pounds of grapefruit.

3/ The term "f.o.b." means the produce is placed free on board in suitable shipping condition, and the buyer assumes all risk of damage and delay in transit not caused by the shipper. The buyer shall have the right of inspection at destination before the goods are paid for, but only for the purpose of determining that the produce shipped complied with the terms of the contract or order at time of shipment.

4/ See appendix for method of selecting sample firms.

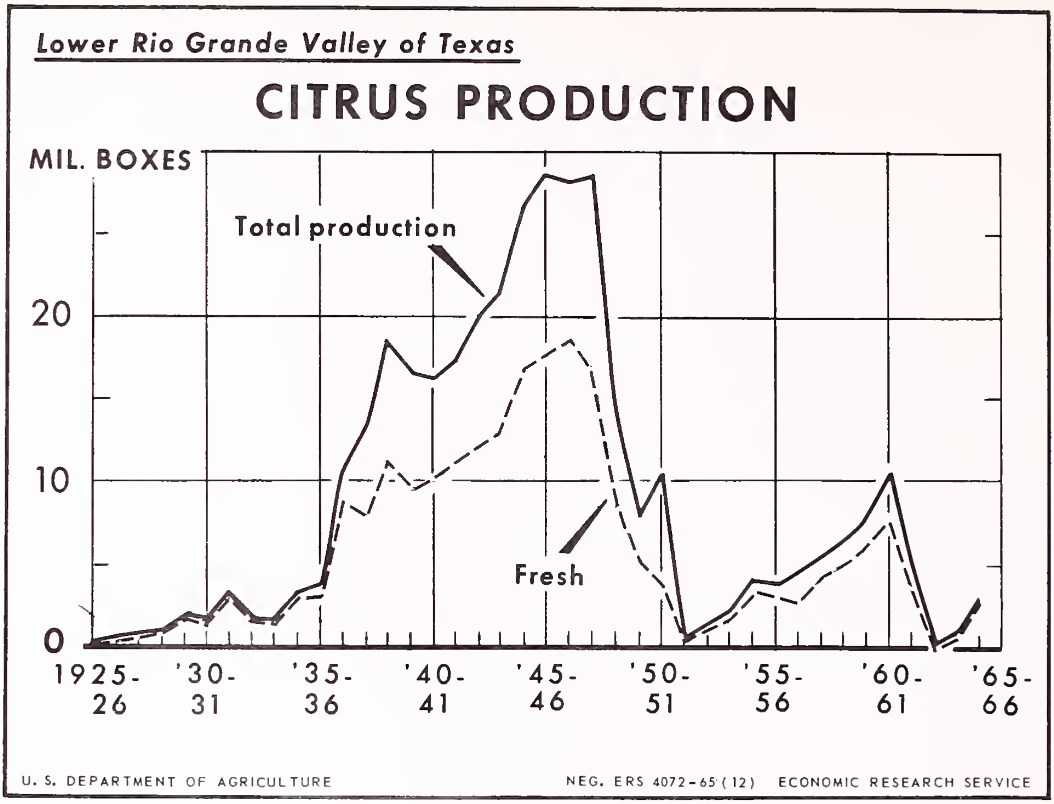

Figure 1

MARKET STRUCTURE

The term "market" refers to all buyers and sellers of a given commodity together with the necessary physical, institutional, and information facilities and services for trading. The economic structure of a market is described in terms of five components: (1) number of firms, (2) the ease with which firms can either begin or end operations in the market, (3) the similarity of products sold by the different firms, (4) the degree to which buyers and sellers discriminate among other buyers and sellers, and (5) how much information buyers and sellers have on market conditions, particularly prices.

Number of Firms

The concentration of operations in a few firms at any level of the marketing system conceivably could enable individual firms to influence prices. Therefore, it is necessary to take at least a cursory look at the number of growers, packers, and wholesale buyers in the Lower Valley citrus market.

In 1960-61, there were about 2,000 growers in the market. Although some sold much larger quantities than others, none appeared to dominate production.

There were 38 shipping firms in the market in 1960-61, including 4 cooperatives. In table 1, these firms are classified by volume shipped. Large firms are those which taken together consituted the smallest group handling 50 percent of the total; medium-sized firms are those making up the smallest group which, together with

Table 1.--Number of firms shipping citrus, and average volume shipped per firm, by size of firm, Lower Rio Grande Valley, Tex., 1960-61 and 1961-62 seasons

Size of firm 1/	Number of firms		Average carlot equivalents shipped	
	1960-61	1961-62	1960-61	1961-62
Large	7	7	885.7	435.4
Medium-sized	7	7	433.6	220.2
Small	7	5	209.1	144.2
Smallest	17	10	28.2	26.4
Total or average	38	29	294.2	192.2

1/ Large firms handled 50 percent of total volume; medium-sized, 30 percent; small, 15 percent; and smallest, 5 percent.

large firms, handled 80 percent of the total; small firms are those whose volume brought the cumulative total to 95 percent; and the smallest firms are those remaining. There were 17 firms in the "smallest firms" category in 1960-61, and 7 in each of the other categories.

The average volume per shipper in the Lower Valley citrus market dropped considerably between the 1960-61 and 1961-62 seasons (table 1). This is understandable, since 1961-62 production was about 47 percent of what it might have been had no freeze occurred. 5/

Data on wholesale citrus buyers were limited to firms buying from the 14 sample shipping firms. (A wholesale buyer is a firm buying 10 or more boxes of citrus during the season.) In 1960-61, the 14 sample shipping firms sold about 4 million boxes of citrus to 984 wholesale customers. In table 2, these buyers are divided into quartiles according to volume bought. The largest buyer purchased 10.6 percent of the total. The second largest buyer alone bought 41,925 more boxes than all of the 738 buyers in the last three quartiles. All told, firms in the first quartile accounted for 92 percent of the citrus purchased from the sample shipping firms.

Another way of looking at concentration of wholesale buyers is in terms of their share in the total volume sold by the sample firms. The top 4 firms received 25 percent of the total volume sold by the sample shippers, the top 25 received 50 percent, the top 84 received 75 percent, and the top 313 received 95 percent.

Based on the first listing in a leading trade directory, 112 of the wholesale buyers in the first quartile were receivers (table 3). However, the 31 buyers classified as chainstores bought a greater quantity of citrus--34.1 percent of the total bought by firms in the first quartile.

To summarize, the Lower Valley citrus market appears to be fairly competitive based on the number of firms at all levels. There are hundreds of growers, and no evidence of market domination by any one grower or group of growers. Although

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5/ Winfrey, R. E. Marketing Texas Citrus, Lower Rio Grande Valley of Texas, Summary of 1961-62 Season. U.S. Dept. Agr., Agr. Mktg. Serv., Fruit and Veg. Div., Nov. 1962.

Table 2.--Citrus sales of 14 sample shippers, buyers grouped by volume purchased, Lower Rio Grande Valley, Tes., 1960-61 season 1/

Volume quartile 2/	Buyers	Volume	Percentage of total volume	Cumulative total		
				Firms	Volume	Percentage of total volume
	Number	Boxes	Percent	Number	Boxes	Percent
First quartile:						
Firm 1	1	429,079	10.6	1	429,079	10.6
Firm 2	1	348,869	8.6	2	777,948	19.2
Firm 3	1	129,105	3.2	3	907,053	22.4
Firm 4	1	107,958	2.7	4	1,015,011	25.1
Firm 5	1	74,155	1.8	5	1,089,166	26.9
Firm 6	1	73,679	1.8	6	1,162,845	28.8
Firm 7	1	69,560	1.7	7	1,232,405	30.5
Firm 8	1	67,073	1.7	8	1,299,478	32.1
Firm 9	1	65,494	1.6	9	1,364,972	33.7
Firm 10	1	58,164	1.4	10	1,423,136	35.2
Firms 11-20	10	470,980	11.7	20	1,894,116	46.8
Firms 21-50	30	724,555	17.9	50	2,618,671	64.8
Firms 51-100	50	547,465	13.6	100	3,166,136	78.3
Firms 101-246	146	570,672	14.1	246	3,736,808	92.4
Second quartile	246	234,321	5.8	492	3,971,130	98.2
Third quartile	246	61,080	1.5	738	4,032,210	99.7
Fourth quartile	246	11,646	.3	984	4,043,856	100.0

1/ Excludes 598 purchasers of less than 10 boxes of citrus. Also excludes information on 965,000 boxes where the citrus buyer was unknown.

2/ Each quartile contains 25 percent of the purchasers. In the first (high) quartile are the buyers of largest volumes, and so on.

Table 3.--Citrus purchases by type of buyer from 14 selected shippers, upper quartile of buyers, Lower Rio Grande Valley, Tex., 1960-61 season

Type of buyer 1/	Buyers	Purchases	
		Volume	Percentage
	Number	Boxes	Percent
Chains	31	1,274,801	34.1
Receivers	112	1,070,067	28.6
Brokers	35	580,433	15.5
Shippers	21	2/ 277,644	7.4
Processors	6	234,400	6.3
Truckers	14	113,724	3.1
Wholesale grocers	13	57,566	1.5
Jobbers	6	40,593	1.1
Commission merchants	2	38,166	1.0
Miscellaneous	3	28,275	.8
Importers	3	21,139	.6
Total	246	3,736,808	100.0

1/ First listing in the Packer Red Book, Packer Publishing Co., Kansas City, Mo., 1963.

2/ Including sales of 110,994 boxes by sample shippers to other sample shippers.

there were only 38 shippers in 1960-61, the fact that 4 of these were cooperatives gave growers some influence on prices. The largest wholesaler buying from the sample shippers took 10.6 percent of the total sold, but was in competition with 983 other buyers, a few of them purchasers on a nearly comparable scale.

Ease of Entry and Exit of Shipping Firms

All but one of the shipping firms classified as large firms in 1960-61 were also classified as large in 1961-62 (table 4). Ten firms that were in the "smallest firms" group in 1960-61 had left the market by the end of the 1961-62 season, probably as a result of the freeze in January 1962. The only new firm entering the market in that season was also in the "smallest firms" group.

Firms changing categories between the two seasons shifted either to the next higher or next lower category--five moved to a lower category and four to a higher. Some of the former apparently were just beginning their citrus operations when the January freeze hit. The large firms made up the most stable group. Six firms remained in this category both seasons, while 9 of the 14 firms in the medium and small categories in 1960-61 had shifted by 1961-62.

Similarity of Product

All 14 shippers in the study sold citrus for the fresh market on the basis of Federal grades. The logical assumption is that citrus of a given variety, grade, Table 4.--Status in 1961-62 of sample shipping firms in market in 1960-61, by size of firm, citrus market, Lower Rio Grande Valley of Texas 1/

Status in 1960-61	Large	Medium	Small	Smallest	Out of market
	-Number-				
Large (7 firms)	6	1	0	0	0
Medium (7 firms)	1	3	3	0	0
Small (7 firms)	0	3	2	2	0
Smallest (17 firms)	0	0	0	7	10
Not in market in 1960-61	0	0	0	1	0
Total	7	7	5	10	10

1/ Large firms handled 50 percent of total volume; medium, 30 percent; small, 15 percent; and smallest, 5 percent.

and size is homogeneous. In a competitive situation, this should be reflected in prices buyers are willing to pay for citrus. Two price comparisons were made to test the similarity of products.

Prices paid by six buyers for identical lots of citrus purchased from the same or different shippers were compared. The lots were matched by variety, grade, size, purchasing firm, and date of purchase. Prices paid by each buyer were converted if necessary to a net f.o.b. price per box. If a given buyer purchased two identical lots of citrus on any day, a price comparison was made. Purchases from the same shipper were treated separately from those made from two different shippers. None of the comparisons revealed any statistically significant differences in prices paid for citrus of identical lots (table 5). On any day, the buyers paid similar prices to the same or different shippers for citrus of a given variety, grade, and size, although average differences in prices were slightly larger when different shippers were involved. It appears that buyers regard two lots of citrus of a given variety, grade, and size as a homogeneous product whether coming from the same or different shippers.

Buyer and Seller Relationships

In the produce business, firms usually sell to regular and established customers. Buyers establish dependable supply sources, and often deal with the same firms over many years. Large buyers are apt to purchase from several shippers in the market area, since sufficient volume may not be available from any one firm. Small volume buyers purchase less often, commonly from the same shipper each time.

In 1960-61, almost two-thirds of the 984 wholesale buyers purchasing fruit from the sample shipping firms limited their purchases to one firm (table 6). Eighteen percent bought from two firms, 9 percent from three firms, and 3 percent from four.

Table 7 shows, for the 10 sample shippers who supplied detailed information, the number of each firm's customers that also bought from other firms. For instance, 60 of the firms buying from shipper B also bought from firm D.

Table 5.--Citrus prices: Matched category test, Lower Rio Grande Valley of Texas, 1960-61 season

Type of observations 1/	Observations	Average differences in price paid per 80-pound equivalent			
		Mean difference	Standard deviation	Mean dif. minus 1.96 stand. dev. 2/	Significance at 95% level 3/
	Number	Dollars	Dollars	Dollars	Dollars
Both of paired purchases bought from the same selling firms:					
Buyer A	53	.15	.24	-.32	N.S.
Buyer B	54	.27	.36	-.44	N.S.
Buyer C	90	.21	.38	-.53	N.S.
Buyer D	170	.22	.37	-.51	N.S.
Buyer E	124	.34	.53	-.70	N.S.
Buyer F	235	.10	.25	-.39	N.S.
Both of paired purchases not bought same selling firms:					
Buyer A	136	.50	.54	-.56	N.S.
Buyer B	148	.44	.51	-.56	N.S.
Buyer C	80	.23	.26	-.28	N.S.
Buyer D	4/	--	--	--	--
Buyer E	43	.32	.37	-.41	N.S.
Buyer F	29	.31	.23	-.14	N.S.

1/ In each pair of sales; prices are matched by date, variety, grade, size, and buyer.
2/ Mean difference minus 1.96 standard deviation is not significant if negative.
3/ N.S.--Buyer did not pay significantly different prices for citrus of same category.
4/ Too few observations for meaningful test.

Table 6.--Distribution of wholesale citrus buyers by number of sample shipping firms dealt with, Lower Rio Grande Valley, Tex., 1960-61 season

Shipper	Total buyers	Percentage of buyers dealing with specified number of shippers												Total
		1	2	3	4	5	6	7	8	9	10	12	14	
	Number	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
A............	183	29.0	27.9	17.5	9.3	4.4	2.7	2.2	2.2	0.5	2.7	1.1	0.5	100.0
B............	278	47.1	17.6	15.5	7.2	4.7	2.5	1.1	1.4	---	1.8	.7	.4	100.0
C............	191	35.1	20.9	16.8	10.0	4.2	4.2	2.1	2.6	.5	2.1	1.0	.5	100.0
D............	149	21.5	23.5	20.8	10.0	6.0	6.7	2.0	3.4	.7	3.4	1.3	.7	100.0
E............	118	33.9	19.5	20.3	9.3	4.2	1.7	2.5	1.7	.9	3.4	1.7	.9	100.0
F............	162	49.4	19.7	11.7	6.9	2.5	2.5	2.5	.6	---	2.5	1.2	.6	100.0
G............	190	44.7	24.2	10.6	4.2	3.7	3.7	1.6	2.6	.5	2.6	1.1	.5	100.0
H............	153	37.3	21.6	14.4	6.5	5.2	4.6	3.3	2.0	.6	2.6	1.3	.6	100.0
I............	96	35.4	16.7	17.7	4.2	5.2	4.2	4.2	4.2	1.0	4.2	2.0	1.0	100.0
J............	68	50.0	13.2	10.2	7.4	---	1.5	2.9	2.9	1.5	7.4	1.5	1.5	100.0
K,L,M,N 1/...	104	27.9	13.5	17.3	7.7	2.9	4.8	6.7	4.8	1.0	4.8	4.8	3.8	100.0
Total customers 2/.	1,692	37.9	20.6	15.7	7.6	4.1	3.5	2.5	2.4	0.5	3.0	1.4	.8	100.0
Total buyers.	984	65.5	17.7	9.1	3.3	1.4	1.0	.6	.5	.1	.5	.2	.1	100.0

1/ Composite of 4 firms for which data were incomplete.
2/ A buyer purchasing from 2 of the sample shippers is counted as 2 customers, and so on.

Table 7.--Citrus buyers dealing with specified combinations of sample shipping firms, Lower Rio Grande Valley, Tex., 1960-61 season 1/

Shipping firm	Buyers 2/	Buyers who also purchased from firm--										Average
		A	B	C	D	E	F	G	H	I	J	
	-Number-											
A.	183	---	54	45	44	27	28	40	31	34	16	35.4
B.	278	54	---	49	60	30	30	41	44	28	20	39.6
C.	191	45	49	---	51	37	26	39	28	25	16	35.1
D.	149	44	60	51	---	23	23	31	39	30	17	35.3
E.	118	27	30	37	23	---	20	27	20	16	11	23.4
F.	162	28	30	26	23	20	---	28	21	10	8	21.6
G.	190	40	41	39	31	27	28	---	27	23	14	30.0
H.	153	31	44	28	39	20	21	27	---	26	12	27.6
I.	96	34	28	25	30	16	10	23	26	---	13	22.8
J.	68	16	20	16	17	11	8	14	12	13	---	14.1

1/ Excluding 4 shippers for which data were incomplete.
2/ Total of 984 buyers.

Table 8 provides data on the likelihood that buyers that deal with one firm will also deal with certain other firms. Thirteen buyers purchased only from shippers B and D among the 10 shippers firms; 6 buyers purchased from shippers C, D, and E only; and at the other end of the spectrum, 2 buyers purchased from 6 firms--A, B, C, D, F, and H. The average number of buyers per combination of sellers is shown in table 9. Buyer and seller relationships are largely economic, that is, based on location of shipping firms and on their ability to supply specified types and qualities of fruit in sufficient quantities and at appropriate times. Shippers in the same area were somewhat more likely to have wholesale customers in common than shippers in different areas. When such factors are considered, the degree of buyer and seller discrimination appears to have been slight.

Among the top quartile of wholesale buyers, 75 (30 percent) bought citrus from only 1 sample firm during the 1960-61 season, and 84 percent bought from less than 5 of the sample firms (table 10).

There was a correlation between the number of sample firms dealt with and the average number of days the buyer was active in the market during the season. Those dealing with only one sample shipper averaged 21 days in the market during the season. The buyer that purchased from all 14 sample firms was active in the market 219 days, and on 2 days purchased from nine of the sample firms. The predominant practice among all buyers, however, was to purchase from only one firm on any one day.

The average small-volume buyer in the top quartile dealt with only a few of the sample firms (table 11). Only 6 percent of the top quartile buyers purchasing as few as 5,000 boxes of citrus bought from more than 4 of the sample shippers, compared with 46 percent of those purchasing 25,000 boxes or more.

Shipping firm size apparently did not influence buyers in their choice of sources of supply. With minor variations, all sample firms sold to about the same distribution of small, medium-sized, and large wholesale customers (table 12). When selling firms were grouped by size, the same relation held true. If anything, small buyers were more apt to deal with large shipping firms than with small ones.

As indicated by these findings, extreme buyer or seller discrimination was not evident in the Lower Valley citrus market. Relationships among buyers and sellers were consistent with fairly competitive market behavior.

Price Information and Communication

Marketing of the 1960-61 Lower Valley citrus crop began September 29, 1960, and continued through most of July 1961. The Federal Market News Service reported f.o.b. shipping-point prices from October 17, 1960, through June 15, 1961. The reports covered 40-pound cartons and master containers holding 12 5-pound film bags (MC 12/5's). Varieties reported were ruby red grapefruit, early oranges (until February 10, 1961), and valencia oranges (February 2 to June 15, 1961). This combination of length of season, varieties of citrus, and containers covered 45 percent of the shipments of oranges and grapefruit by the sample firms. Figure 2 shows f.o.b. prices in the 1960-61 season. The prices represent the weekly average of midpoints for the daily range reported by the Market News Service.

Sizes reported were 32, 36, 40, and 48 for ruby red grapefruit; 80, 100, and 126 for early oranges and valencia oranges. These sizes made up over 95 percent

Table 8.--Combination of sample shipping firms having more than average number of buyers in common, Lower Rio Grande Valley, Tex., 1960-61 season [1]

Combination of firms	Buyers
B D	13
A B	12
C G	10
A G	9
B H	9
F G	9
C D	8
C F	7
A C	6
A D	6
A I	6
B G	6
A F	5
D H	5
G H	5
C D E	6
B C E	5
A B C	3
A B D	3
A D I	3
B E H	3
A B H	2
A C F	2
A E G	2
A E I	2
A F G	2
B C D	2
B C G	2
B C J	2
B D H	2
B F G	2
B F H	2
B G H	2
C D I	2
A B D F	2
A B D J	2
A C D E	2
A E F G	2
A B C D F	2
A B C D F H	2

---

[1] See table 9 for average number of buyers per combination.

Table 9.--Average number of wholesale buyers dealing with combinations of sample shipping firms, Lower Rio Grade Valley, Tex., 1960-61 season

Number of shippers in combination	Observed combinations of shippers 1/	Buyers all combinations	Buyers per combination
	Number	Number	Number
2	39	175	4.4
3	63	82	1.3
4	22	26	1.2
5	15	16	1.1
6	12	13	1.1
7	4	4	1.0
8	2	2	1.0
9	3	3	1.0
10	1	4	4.0

1/ Some combinations of sellers did not have buyers in common. For example, with 10 sellers there are 45 possible combinations of 2 sellers--6 of these did not have a common buyer. Likewise, there were 120 possible combinations of 3 sellers, out of which 57 did not have a common buyer, and so forth.

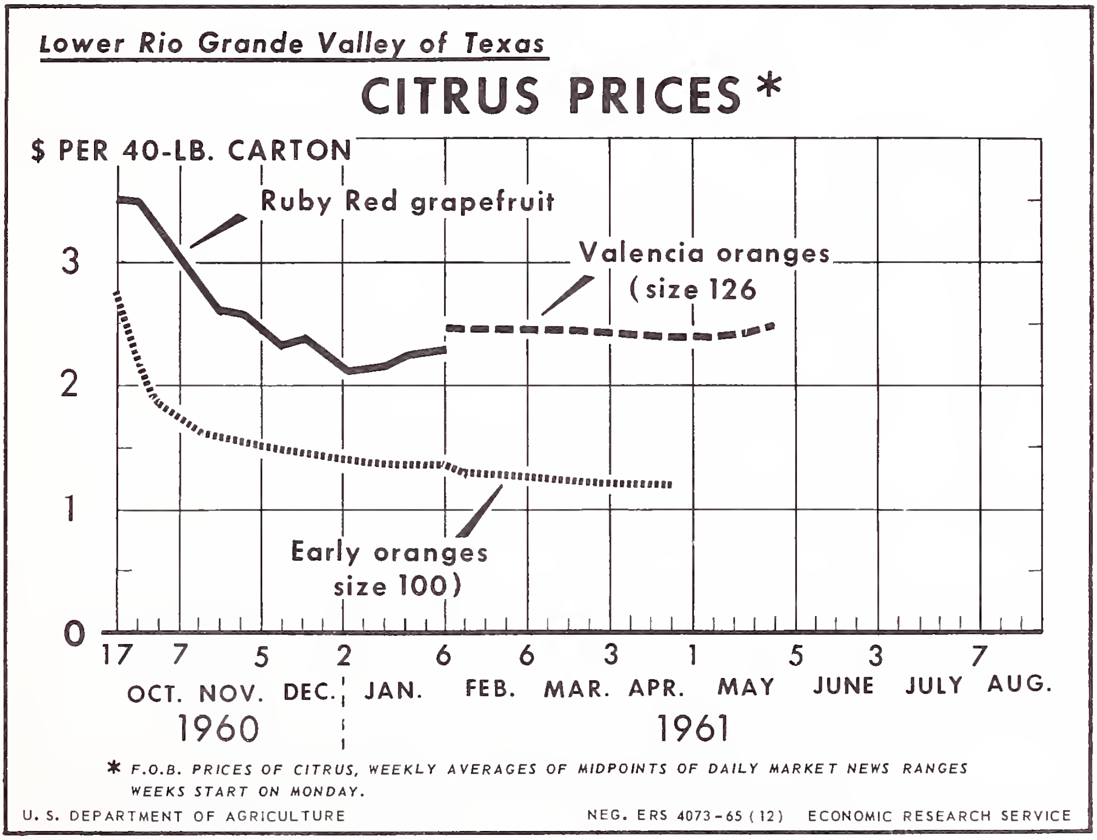

Figure 2

Table 10.--Wholesale buyers, top quartile: Frequency of citrus purchases related to number of sample shipping firms dealt with over the season, Lower Rio Grande Valley, Tex., 1960-61 season

Number of sample firms dealt with over season	Buyers		Average number of days buyers made purchases from--								Average number of days in market
			1 firm	2 firms	3 firms	4 firms	5 firms	6 firms	7 firms	9 firms	
	No.	Pct.	Days	Days	Days	Days	Days	Days	Days	Days	Days
1	75	30.5	20.9	---	---	---	---	---	---	---	20.9
2	57	23.2	27.4	0.6	---	---	---	---	---	---	28.0
3	49	19.9	29.2	1.4	0.1	---	---	---	---	---	30.7
4	26	10.6	34.0	2.6	0.2	---	---	---	---	---	36.8
5	13	5.3	52.9	6.8	1.3	0.1	---	---	---	---	61.1
6	8	3.3	52.7	7.0	.1	---	---	---	---	---	59.8
7	5	2.0	40.8	11.4	1.4	.2	---	---	---	---	53.8
8	4	1.6	58.0	18.7	9.5	1.0	---	---	---	---	87.2
9	1	.4	69.0	33.0	4.0	---	---	---	---	---	106.0
10	5	2.0	68.6	25.8	7.4	1.2	---	---	---	---	103.6
11	0	---	---	---	---	---	---	---	---	---	---
12	2	.8	59.5	48.0	26.5	15.5	11.0	6.5	4.0	---	171.0
13	0	---	---	---	---	---	---	---	---	---	---
14	1	.4	48.0	43.0	39.0	45.0	26.0	15.0	1.0	2.0	219.0

1/ See footnote 2, table 2, for definition of top quartile.

Table 11.--Top quartile wholesale buyers distributed by number of sample shipping firms dealt with, buyers grouped by volume of citrus bought, Lower Rio Grande Valley, Tex., 1960-61 season 1/

Number of sample firms dealt with over season	Buyers of specified number of boxes				Percentage of buyers purchasing specified number of boxes						
	2,000-4,999	5,000-24,999	25,000 and over	Total	2,000-4,999	5,000-24,999	25,000 and over	2,000-4,999	5,000-24,999	25,000 and over	Total
	No.	No.	No.	No.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
1	45	25	5	75	41	24	17	60	33	7	100
2	31	21	5	57	28	20	17	54	37	9	100
3	19	26	4	49	17	24	13	39	53	8	100
4	9	15	2	26	8	14	7	34	58	8	100
5	1	9	3	13	1	8	10	8	69	23	100
6	2	4	2	8	2	4	7	25	50	25	100
7	2	2	1	5	2	2	3	40	40	20	100
8	1	2	1	4	1	2	3	25	50	25	100
9	---	---	1	1	---	---	3	---	---	100	100
10	---	2	3	5	---	2	10	---	40	60	100
11	---	---	---	---	---	---	---	---	---	---	---
12	---	---	2	2	---	---	7	---	---	100	100
13	---	---	---	---	---	---	---	---	---	---	---
14	---	---	1	1	---	---	3	---	---	100	100
Total	110	106	30	246	100	100	100	45	43	12	100

1/ See footnote 2, table 2, for definition of top quartile.

Table 12.--Top quartile wholesale buyers purchasing from specified firms distributed by volume purchased from all shipping firms, Lower Rio Grande Valley, Tex., 1960-61 season 1/

Selling firm 1/	Buyers of specified number of boxes				Percentage of buyers purchasing specified number of boxes			
	2,000-4,999	5,000-24,999	25,000 and over	Total	2,000-4,999	5,000-24,999	25,000 and over	Total
	Number	Number	Number	Number	Percent	Percent	Percent	Percent
Individual firms:								
A.	37	35	18	90	41	39	20	100
B.	37	53	18	108	34	49	17	100
C.	32	42	12	86	38	48	14	100
D.	18	35	17	70	26	50	24	100
E.	17	24	10	51	34	46	20	100
F.	18	21	12	51	36	41	23	100
G.	18	26	13	57	31	46	23	100
H.	15	29	11	55	27	53	20	100
I.	13	14	15	42	31	33	36	100
J.	10	14	11	35	28	40	32	100
Selling firms by size of category:								
Large firms.	106	130	48	284	37	46	17	100
Medium firms	46	61	36	143	32	43	25	100
Small firms.	63	102	53	218	29	47	24	100

1/ Excluding 4 firms were data were incomplete. See footnote 2, table 2, for definition of top quartile.

of the sample volume of ruby red grapefruit, 87 percent of the sample volume of early oranges, and 80 percent of the sample volume of valencia oranges. Thus, the varieties of fruit, types of containers, and sizes of fruit covered by the Market News system in reporting shipping-point prices were well chosen.

The Federal Market News Service did not report "on-tree" prices for citrus in 1960-61. Lower Valley growers apparently rely on word of mouth and other informal sources for this information. Citrus growers in California and Florida also obtain information about on-tree prices by informal methods. In California, most of the crop is handled by cooperatives, and returns to growers are not final until the end of the season. A sizable portion of the Florida citrus crop also, is marketed through cooperatives. In addition, a growers' association publishes a weekly report on prices paid for citrus delivered to the packing shed or processing plant.

The current f.o.b. price is difficult to convert into terms of grower prices, especially when the expectation of future changes in f.o.b. prices is brought into the picture. There is need for a reliable reporting service in the Lower Valley to publish either weekly or biweekly a survey of contract prices for citrus of selected varieties and sizes on a clean-tree or other basis.

RELATION OF F.O.B. PRICES TO PRICES PAID GROWERS

In theory, prices paid growers would vary directly with f.o.b. prices, and an increase or decrease in f.o.b. prices would be accompanied by an increase or decrease in growers' prices. In practice, certain factors obscure this relationship. For example, citrus is generally contracted for before harvest, with the price agreed upon at that time. Second, an increase in the percentage of high quality citrus packed by shippers tends to increase f.o.b. prices even if grower prices for each grade remain constant. Third, the relationship between f.o.b. prices and prices paid growers varies with changes in packing and harvesting costs.

The spread between f.o.b. prices and prices paid growers is called the shipping-point margin. To permit analysis of shipping-point margins of sample firms, a weighted average f.o.b. price for 1960-61 was computed for (1) all grapefruit, (2) all oranges, (3) early oranges, (4) valencia oranges, and (5) ruby red grapefruit. The f.o.b. price for each variety is the weighted average price of all grades of that variety. This creates a "blend" f.o.b. price for a given variety comparable to the blend price paid farmers. The f.o.b. prices for oranges and grapefruit are the weighted average prices of all varieties of oranges and grapefruit.

Citrus margins fluctuate from day to day because of fairly stable grower prices and variable f.o.b. prices. F.o.b. prices are determined daily, whereas grower prices are in part determined daily and in part by contracts made days or weeks before harvest. A conservative estimate is that, in 1960-61, 50 percent or more of the citrus packed by shipping firms other than cooperatives was contracted for in advance of harvest. Half of the contract citrus was harvested in the week following the contract date (table 13). Nearly 10 percent was harvested more than 4 weeks after the contract date. The price paid to growers evidently was not related to the time interval (table 14). Since contract prices are agreed upon before harvest, they reflect expected f.o.b. prices as well as current f.o.b. prices. Or, in terms of margins, today's margin is influenced by contracts made several days or weeks ago. However, the practice of contracting assures that packing firms will receive an adequate volume of citrus, helps to reduce packing and harvesting costs, and helps to avoid peaking and valleying of fruit received from the groves.

Table 13.--Distribution of citrus purchased by sample shipping firms, by interval between contract date and harvest date, selected varieties, Lower Rio Grande Valley, Tex., 1960-61 season

Days between contract and harvest date	Early oranges	Valencia and navel oranges	Ruby red grapefruit	Other grapefruit	Total
	Percent				
None.	2.5	6.1	5.3	9.8	5.8
1 to 3 days	24.8	15.2	29.8	23.6	25.7
4 to 6 days	20.4	17.8	22.7	15.6	20.2
Subtotal	47.7	39.1	57.8	49.0	51.7
1 to 2 weeks.	26.3	26.4	20.5	16.6	21.6
2 to 4 weeks.	21.6	18.8	15.5	16.9	17.4
Over 4 weeks.	4.4	15.7	6.1	17.5	9.3
Total	100.0	100.0	100.0	100.0	100.0

Table 14.--Purchases of ruby red grapefruit at various price ranges, distributed by time interval between contract date and harvest date, Lower Rio Grande Valley, Tex., 1960-61.

Time interval between contract and harvest date	On-tree price per ton							
	0 to $9.99	$10.00 to $19.99	$20.00 to $29.99	$30.00 to $39.99	$40.00 to $49.99	$50.00 to $69.99	$70.00 to $89.99	Average
	Percent							
None.	11	4	4	5	9	10	5	5
1 to 3 days	22	34	26	36	23	28	38	30
4 to 6 days	17	23	21	18	19	22	37	23
Subtotal.	50	61	51	59	51	60	80	58
1 to 2 weeks.	6	26	22	17	23	12	16	20
2 to 4 weeks.	44	7	20	21	15	14	4	16
Over 4 weeks.	--	6	7	3	11	14	--	6
Total	100	100	100	100	100	100	100	100

In general, prices paid growers by the sample shippers corresponded to the f.o.b. blend prices (figs. 3 and 4). The pattern varied more for the different varieties of oranges that it did for grapefruit.

For the 1960-61 season, the average daily shipping-point margin per 80-pound equivalent was $1.80 for early oranges and valencia oranges, and $1.67 for all oranges (table 15). The shipping-point margin for ruby red grapefruit was $1.63, and for all grapefruit was $1.57 per 80-pound equivalent.

Early oranges were available in volume from mid-October to the end of February. During most of the 123-day period, the shipping-point margin for early oranges varied from $1.25 to $2.25 (table 16). Early oranges included Hamlins, Marrs, Temples, and Joffas, as well as fruit simply described as early oranges without designation of variety.

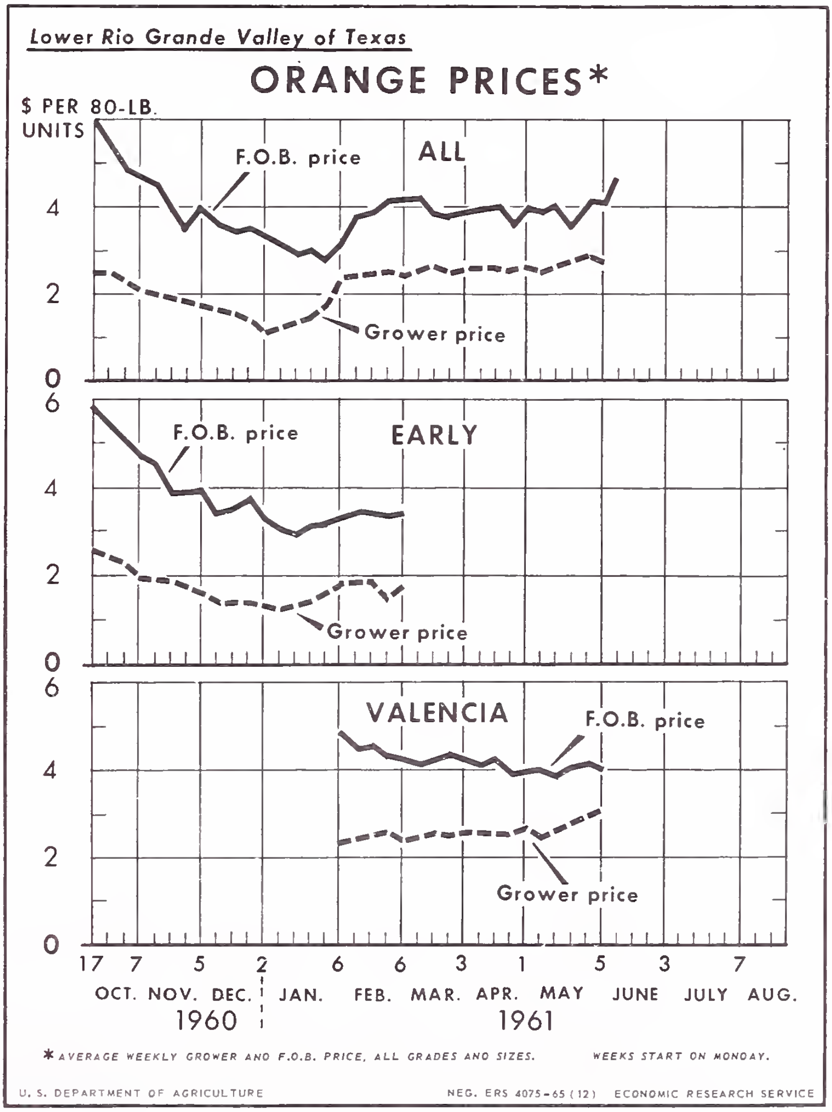

Figure 3

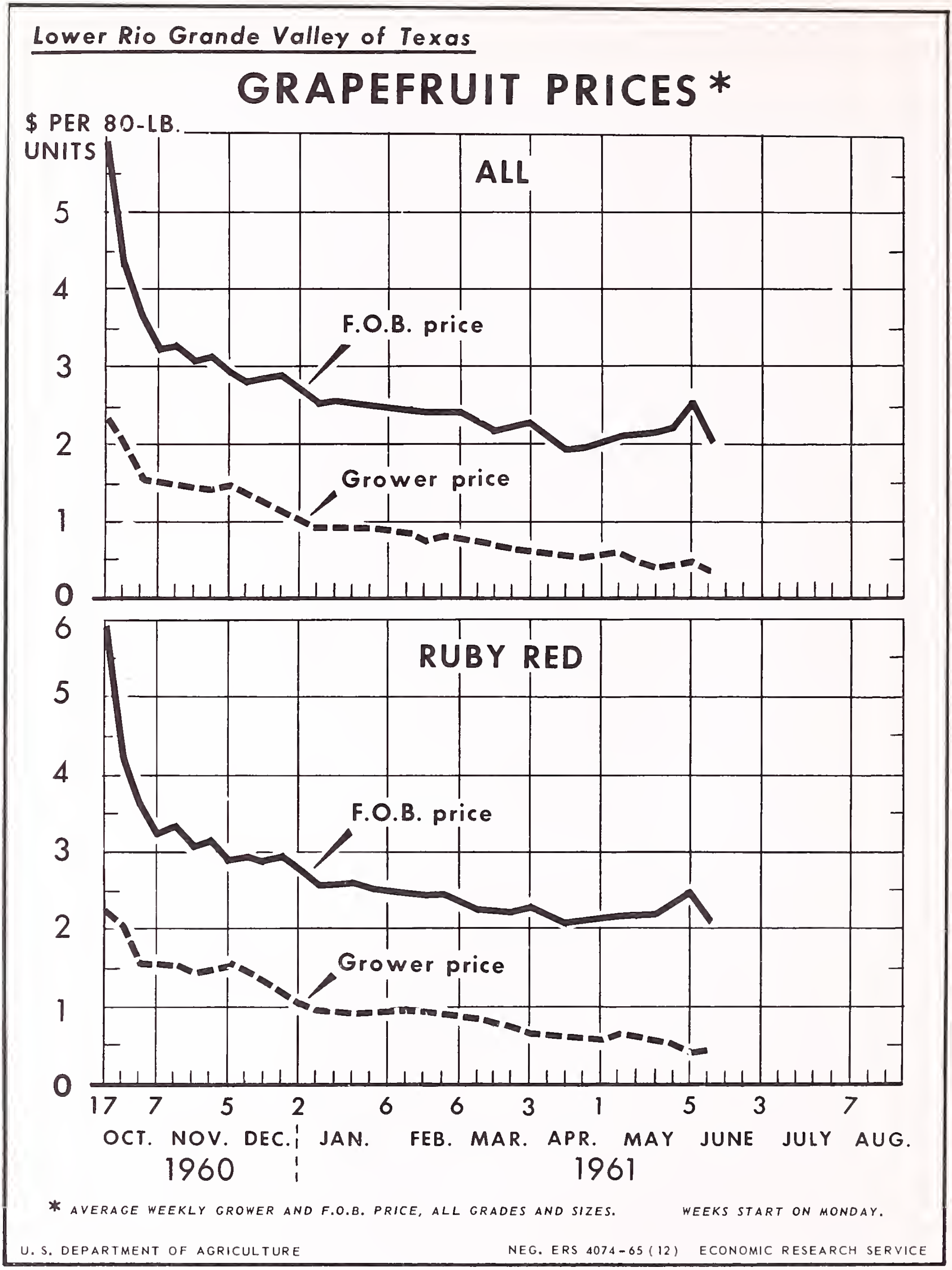
Lower Rio Grande Valley of Texas
GRAPEFRUIT PRICES *
$ PER 80-LB. UNITS
ALL
F.O.B. price
Grower price
RUBY RED
F.O.B. price
Grower price
0
1
2
3
4
5
6
17
7
5
2
6
6
3
1
5
3
7
OCT.
NOV.
DEC.
JAN.
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
1960
1961
* AVERAGE WEEKLY GROWER AND F.O.B. PRICE, ALL GRADES AND SIZES.
WEEKS START ON MONDAY.
U. S. DEPARTMENT OF AGRICULTURE
NEG. ERS 4074-65 (12)
ECONOMIC RESEARCH SERVICE

Figure 4

Table 15.--Average f.o.b. prices, grower prices, and shipping-point margins per 80-pound equivalent of citrus, sample shipping firms, Lower Rio Grande Valley, Tex., 1960-61 season

Firms	Average f.o.b. price	Average grower price	Average shipping-point margin
	Dollars	Dollars	Dollars
All sample firms:			
Early oranges	3.56	1.76	1.80
Valencia oranges	4.18	2.38	1.80
All oranges 1/	3.77	2.10	1.67
Ruby red grapefruit	2.56	.93	1.63
All grapefruit 2/	2.49	.92	1.57
Cooperatives:			
Early oranges	3.27	1.90	1.37
Valencia oranges	3.82	2.26	1.56
All oranges 1/	3.38	2.12	1.26
Ruby red grapefruit	2.32	.78	1.54
All grapefruit 2/	2.24	.76	1.48
Other firms:			
Early oranges	4.22	1.60	2.62
Valencia oranges	4.56	2.47	2.09
All oranges 1/	4.08	2.08	2.00
Ruby red grapefruit	2.69	1.00	1.69
All grapefruit 2/	2.63	.99	1.64

1/ In addition to early and valencia oranges, includes data on navel oranges and oranges for which the variety was not specified.

2/ In addition to ruby red grapefruit, includes data on marsh white, marsh pink, and foster pink grapefruit and grapefruit of which the variety was not specified.

Table 16.--Number of days citrus shipping-point margins were below, above, or between $1.25 and $2.25, sample shipping firms, Lower Rio Grande Valley, Tex., 1960-61 season

Variety	Less than $1.25	$1.25 to $2.25	Over $2.25	Total
	Days	Days	Days	Days
Early oranges	5	79	39	123
Valencia oranges	18	78	11	107
All oranges 1/	36	135	50	221
Ruby red grapefruit	16	206	19	241
All grapefruit 2/	16	208	20	244

1/ See footnote 1, table 15.
2/ See footnote 2, table 15.

Valencias were marketed in volume from the early part of February until the end of May. The shipping-point margin for valencias varied between $1.25 and $2.25 during most of the season. There was a gradual convergence of grower prices and f.o.b. prices as the season progressed, a condition not observed with early oranges and grapefruit. The explanation may be in grower contracts. F.o.b. prices of early oranges were depressed in January, and this was reflected in contract prices for valencias which ranged from about $50 to $60 per ton during the month. These contracts included a good portion of the valencias harvested during February and early March. By mid-February, prices for all oranges had spurted upward, and contracts for valencias were generally $60 to $65 per ton. These contracts included many of the valencias harvested in late March and April. The lagged influence of contracts created a rising blend grower price which was contrary to the declining f.o.b. price. This illustrates some of the problems in relating f.o.b. prices to prices paid growers.

Ruby red grapefruit were available in volume from the middle of October to the middle of June. The shipping-point margin on ruby reds varied from $1.25 to $2.25 for 206 days during the 231 day season. Margins were over $2.25 on 19 days and below $1.25 on 16 days. The price and margin pattern for all grapefruit was similar to that of ruby reds, in part because ruby reds comprised 74 percent of the total grapefruit and in part because other varieties--marsh white and marsh pink--had similar patterns to ruby reds.

Typically, harvesting and packing costs per box of citrus go down as volume increases. Unit costs are high during the start of the season when the volume of fruit is low and citrus is harvested and packed in small quantities. As the season progresses, the volume of fruit increases and unit costs decline, since packing and handling charges are spread over a large volume of products. As the season draws to a close, volume again decreases, and the cost of packing increases.

Quality also affects packing costs. With poorer quality fruit, grading costs increase, packing lines are slowed, and unit costs rise. The reverse is true for better quality citrus.

In practice, these cost changes are not immediately reflected in margins and growers returns, since much of the citrus is contracted for in advance of the harvest date. The f.o.b. blend price increases when quality rises, but grower prices stay relatively stable, thereby increasing shipping-point margins. 6/ When quality falls less top grade citrus is packed, and the blend f.o.b. price declines, in turn lowering the shipping-point margin.

Two statistical tests of weekly data were made showing the effect of quality and volume of citrus on shipping-point margins for early oranges, valencia oranges, and ruby red grapefruit. (See appendix for method.) In each instance, quality and volume were found to be significantly related to margins (appendix table 21). Margins generally increased as volume decreased and vice versa as expected. Also, as the percentage of U.S. No. 1 grade fruit shipped increased, the margin increased, and as the percentage decreased, the margin decreased.

Citrus shippers in the Lower Valley market included four cooperatives handling roughly 24 percent of the Lower Valley crop in 1960-61. Typically, cooperatives make growers a partial payment for their fruit. Then they determine a blend price

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6/ This is not to say that contract prices are not based on quality as judged by the buyer at the time the contracts are written.

based on returns from citrus sales minus operating expenses. The final payment is generally not made until the end of the operating season. The market influence of cooperatives is limited when growers are dependent on packers for financing and contracts are made for sale of fruit before harvest. An indication of the influence that cooperatives exert can be obtained by comparing the seasonal data for cooperatives in table 15 with data on the other sample firms.

The cooperatives realized lower average f.o.b. prices for the five categories of citrus (early oranges, valencia oranges, all oranges, ruby red grapefruit, and all grapefruit) than did other firms. However, the cooperatives also had lower shipping-point margins on all five categories. Cooperatives paid higher average grower prices on early oranges and all oranges, but lower prices on valencia oranges, ruby red grapefruit, and all grapefruit. [7]

One explanation of the lower f.o.b. prices received by cooperatives is quality of fruit shipped. Cooperatives usually try to handle all stable fruit of their members, whereas other shippers can be more selective in their purchases. In 1960-61, the cooperatives shipped about equal amounts of U.S. No. 1 and U.S. No. 2 grade citrus, whereas other firms in the sample shipped from three to six times as much U.S. No. 1 as U.S. No. 2 (table 17). Cooperatives also shipped higher percentage of U.S. Combination Grade and juice fruits than the other firms.

In summary, f.o.b. prices and prices paid growers were reasonably related over the major part of the season even though response was lagged because of contracting. Advance contracts, quality changes, and other factors prevent a perfect translation of f.o.b. values back to grower prices. Over time, however, the market forces in the Valley tend to smooth out these effects.

RELATIONSHIP OF PRICES OF CITRUS PACKED IN DIFFERENT TYPES OF CONTAINERS

The three types of containers predominantly used by the sample shippers in 1960-61 were the 40-pound carton, the master carton holding 12 5-pound film bags (MC 12/5), and the bulk master carton (table 18).

One way to measure how efficiently a shipping-point market performs in price making is to find how closely prices of different containers are correlated. Theoretically, when the price of citrus in 40-pound cartons changes, the price of the same variety, grade, and size citrus in MC 12/5's should change by the same amount per pound. If the price of cartons is high relative to the price of MC 12/5's, shippers will, theoretically, stop packing MC 12/5's and pack only cartons. In actual practice, different containers are usually sold to different customers and shifts in containers require adjustments of packing lines by the shipper. This prevents attaining the theoretical relation. Comparison of the degree to which prices of different containers are correlated, however, provides an indication of pricing efficiency.

Thirty-six percent of the ruby red grapefruit packed by the sample shippers in 1960-61 was size 80 and 41 percent was size 96. Average weekly prices of U.S. No. 1 grade ruby red grapefruit of these sizes packed in 40-pound cartons and in MC 12/5's

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[7] Cooperatives handled 1 1/2 times as much grapefruit as oranges, while other firms handled 2 1/3 times as much.

Table 17.--Sales of specified varieties of citrus distributed by grade, sample shipping firms, Lower Rio Grande Valley, Tex., 1960-61 season

Variety and grade	Cooperatives	Other firms	Total sample firms
	Percent	Percent	Percent
Early oranges:			
No grade designated	31.07	13.03	25.50
U.S. No. 1	12.54	73.17	31.26
U.S. No. 2	12.45	13.32	12.71
U.S. Combination	13.04	.23	9.09
Juice	30.90	.25	21.44
Total	100.00	100.00	100.00
Valencia oranges:			
No grade designated	26.53	6.53	16.78
U.S. No. 1	23.16	76.20	49.00
U.S. No. 2	26.90	17.20	22.17
U.S. Combination	5.36	.07	2.80
Juice	18.05	---	9.25
Total	100.00	100.00	100.00
All oranges: 1/			
No grade designated	27.45	32.30	30.12
U.S. No. 1	15.50	47.92	33.34
U.S. No. 2	16.80	15.92	16.31
U.S. Combination	8.95	.33	4.21
Juice	31.30	3.53	16.02
Total	100.00	100.00	100.00
Ruby red grapefruit:			
No grade designated	27.13	14.27	18.78
U.S. No. 1	36.73	65.59	55.46
U.S. No. 2	30.84	18.91	23.10
U.S. Combination	4.81	.45	1.98
Juice	.49	.78	.68
Total	100.00	100.00	100.00
All grapefruit: 2/			
No grade designated	27.81	16.52	20.50
U.S. No. 1	34.44	61.73	52.10
U.S. No. 2	29.62	19.31	22.95
U.S. Combination	4.40	.56	1.92
Juice	3.73	1.88	2.53
Total	100.00	100.00	100.00

1/ See footnote 1, table 15.
2/ See footnote 2, table 15.

Table 18.--Percentage of citrus sold in specific types of containers, by variety, sample shipping firms, Lower Rio Grande Valley, 1960-61 season

Variety	40-lb. carton	MC 12/5	MC 6/8	MC bulk	Wirebound boxes	1/2 Wirebound boxes	20-lb. sack	Bulk	Miscell-aneous	Total
	-Percent-									
Oranges, variety not known	19.1	18.5	---	31.7	0.6	2.1	4.5	23.5	1/	100.0
Early oranges.	22.3	25.1	---	23.4	1.4	1.3	5.6	20.8	0.1	100.0
Valencias.	36.5	25.5	0.3	23.0	.5	.4	4.3	2.0	7.5	100.0
Navel oranges.	74.4	10.0	---	4.0	1.1	1.6	7.6	1.2	.1	100.0
Total oranges.	27.2	22.8	.1	25.5	.9	1.3	4.8	14.9	2.5	100.0
Grapefruit, variety not known.	14.7	9.3	.8	22.3	1.8	.2	19.2	31.7	1/	100.0
Ruby red grapefruit. . . .	50.7	15.5	2.0	19.5	1.3	3.7	6.4	.8	.1	100.0
Marsh white grapefruit . .	58.4	10.6	7.3	16.0	2.7	2.8	.8	1.4	1/	100.0
Marsh pink grapefruit. . .	52.4	11.0	.5	20.7	1.4	9.3	2.9	1.8	1/	100.0
Foster pink grapefruit . .	93.4	---	---	---	1.9	.1	---	4.6	---	100.0
Total grapefruit	49.5	14.4	2.4	19.3	1.4	3.7	6.4	2.7	.1	100.0
Tangerines	.4	---	---	---	2.2	92.5	.1	.8	4.0	100.0
Tangelos	---	---	---	---	---	---	---	---	---	---
Limes.	---	14.3	---	---	38.1	---	---	---	47.6	100.0
Gift package, mixed. . . .	37.3	13.4	2.4	26.4	1.3	1.4	1.0	7.8	9.0	100.0
Mexican tangerines	---	---	---	---	---	79.4	---	20.6	1/	100.0
Mexican oranges.	.9	4.5	---	.5	11.6	79.6	1.9	.9	.1	100.0
Unidentified citrus. . . .	50.9	.5	---	---	---	.3	.5	47.8	1/	100.0
Total miscellaneous. . .	8.7	2.2	.1	1.1	4.3	65.8	.8	16.6	.4	100.0
All citrus	41.0	16.7	1.6	20.7	1.3	5.0	5.7	7.1	.9	100.0

1/ Less than 0.1 percent.

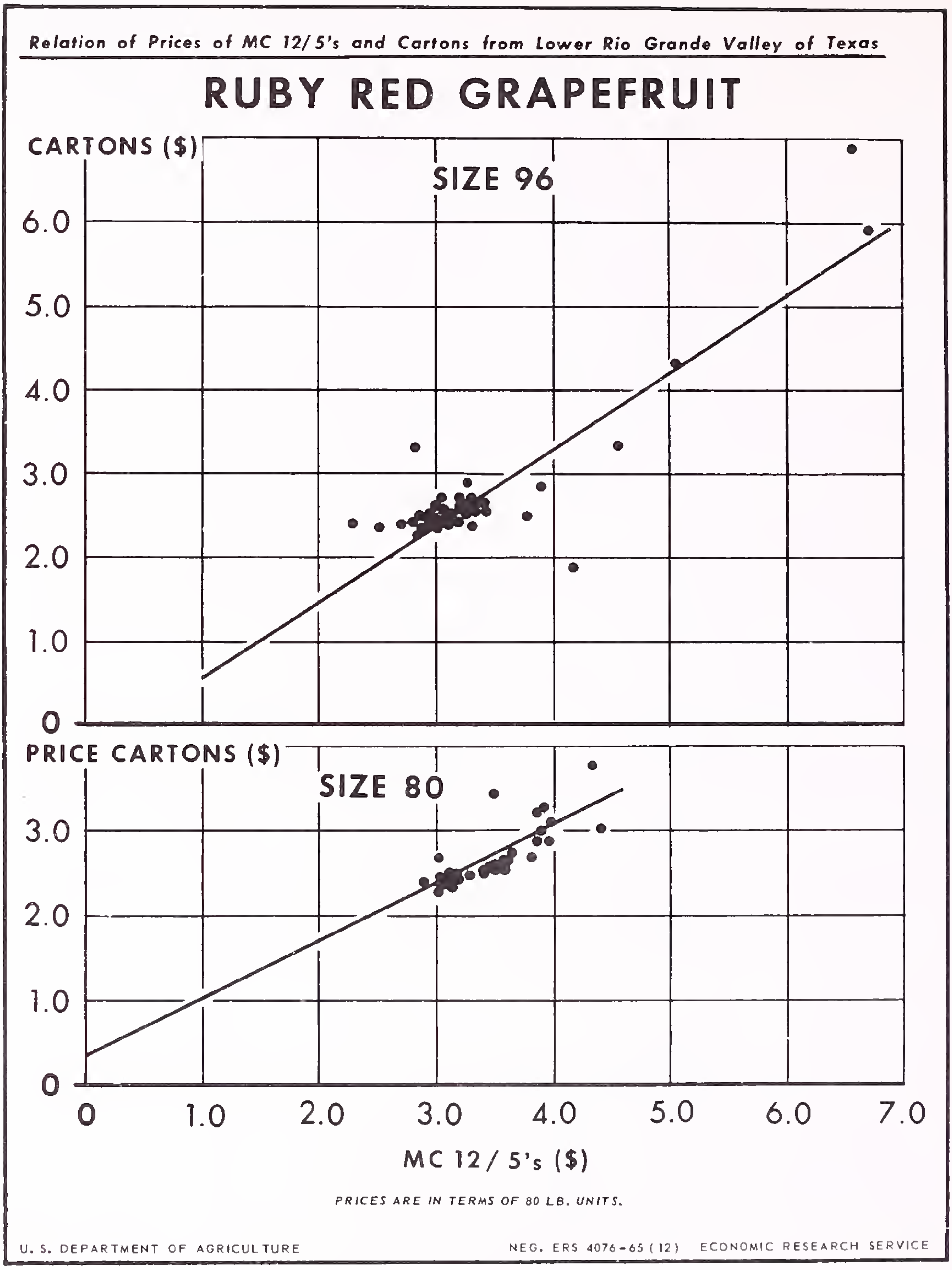
Relation of Prices of MC 12/5's and Cartons from Lower Rio Grande Valley of Texas
RUBY RED GRAPEFRUIT
CARTONS ($)
SIZE 96
6.0
5.0
4.0
3.0
2.0
1.0
0
PRICE CARTONS ($)
SIZE 80
3.0
2.0
1.0
0
0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
MC 12/5's ($)
PRICES ARE IN TERMS OF 80 LB. UNITS.
U. S. DEPARTMENT OF AGRICULTURE
NEG. ERS 4076-65 (12)
ECONOMIC RESEARCH SERVICE

Figure 5

varied directly with each other, although the relationships were not perfect (fig. 5). The form of the relationship is:

$$\text{Price cartons} = a + b\,(\text{price MC } 12/5\text{'s})$$

where the constant term "a" reflects the difference in cost between packing 80 pounds of grapefruit in MC 12/5's and packing the same quantity in 40-pound cartons. We would expect "a" to be negative, since it probably costs more to pack 80 pounds of grapefruit in MC 12/5's than in cartons. Since prices for MC 12/5's and cartons were converted to prices of 80-pound equivalents "b" should be close to 1.0. The actual statistical relationships in this case were:

Size 80: Price of cartons = $0.31 +0.69 (price of MC 12/5's)
Size 96: Price of cartons = -$0.32 +0.91 (price MC 12/5's)

R = 0.9

Thus, for size 96 "a" is negative and "b" is close to 1.0, as expected. Both equations are statistically significant. For size 80 "a" is positive and "b" is not close to 1.0. indicating that the degree of pricing efficiency as measured by the relation between the two containers was not high. For size 96, pricing efficiency so measured was reasonably high.

COMPARISON OF SALES BY TERMS OF SALE

Apart from sales made at auction, shippers in the Lower Valley sell fresh citrus in three principal ways: f.o.b. shipping point, delivered, 8/ or on consignment.

In 1960-61, nearly 60 percent of the U.S. No. 1 and U.S. No. 2 grade ruby red grapefruit sizes 54 to 96 packed in cartons and MC 12/5's by the sample firms was sold f.o.b. About the same proportion was sold delivered as was sold on consignment. The auction was the major outlet for U.S. No. 2 grade ruby red grapefruit packed in cartons.

A comparison of f.o.b. equivalent prices for U.S. No. 1 and 2 grades of ruby red grapefruit of five sizes, packed in cartons and MC 12/5's, showed no consistent pattern of differences among f.o.b., delivered, and consigned sales (table 19). Auction prices were generally lower than prices for other terms of sale.

To correct for the possibility that delivered sales were made mostly on a low market and f.o.b. sales on a high market, prices were compared for days on which both types of sales were made (table 20). Prices received for f.o.b. sales exceeded those made on a delivered basis more than half the time; however, the few days on which the price on f.o.b. sales was materially higher were counterbalanced by days on which the reverse was true. For all days on which both types of sale were made, prices on f.o.b. sales averaged higher than prices of delivered sales on most sizes of fruit, but the differences were, for the most part, slight.

8/ The term "delivered" means that the produce is to be delivered by the seller at the market in which the buyer is located, or at such other market as agreed upon, free of any and all charges for the transportation or protective service. The seller assumes all risks of loss and damage in transit not caused by the buyer, and the produce must meet all the requirements as to quality, condition, and grade.

Table 19.--Ruby red grapefruit: Average f.o.b. price and percentage distribution of total sold, by type of container and sale, sample shipping firms, Lower Rio Grande Valley, Tex., 1960-61 season

Container, grade, and size	F.o.b.	Delivered 1/	Consign-ment 1/	Auction	F.o.b.	Delivered	Consign-ment	Auction	Total	80-lb. equivalents
	Dollars	Dollars	Dollars	Dollars	Percent	Percent	Percent	Percent	Percent	Boxes
Cartons:										
U.S. No. 1, size--										
54	3.30	3.02	3.91	3.01	65.1	23.1	10.0	1.8	100.0	20,624
64	3.40	3.22	3.29	2.05	65.8	18.4	13.7	2.1	100.0	70,430
70	3.07	2.84	3.02	1.73	55.4	20.2	22.1	2.2	100.0	73,665
80	2.82	2.96	2.98	2.30	58.9	17.3	23.4	2/	100.0	308,308
96	2.76	2.52	2.85	2.37	56.0	33.6	10.0	.4	100.0	393,310
U.S. No. 2, size--										
54	2.76	1.95	1.39	1.00	28.3	11.9	16.1	43.7	100.0	3,141
64	2.78	1.93	1.90	1.26	29.6	16.8	12.4	41.2	100.0	9,071
70	2.69	1.96	2.35	1.30	15.5	8.9	18.0	57.6	100.0	12,972
80	2.51	1.90	2.18	1.26	23.8	20.0	15.4	40.8	100.0	34,169
96	1.99	2.11	1.79	1.31	68.5	24.8	2.6	4.1	100.0	110,338
MC 12/5's:										
U.S. No. 1, size--										
54	1.87	---	2.38	---	76.0	---	24.0	---	100.0	35
64	3.07	2.87	---	---	18.4	81.6	---	---	100.0	2,104
70	3.18	2.93	2.39	1.45	55.6	42.7	1.4	.3	100.0	2,798
80	3.23	3.57	3.11	3.17	38.8	59.2	1.5	.5	100.0	107,601
96	3.28	3.48	2.96	3.27	48.1	38.4	12.7	.7	100.0	64,452
U.S. No. 2, size--										
54	---	---	---	---	---	---	---	---	---	---
64	2.18	---	---	---	100.0	---	---	---	100.0	65
70	2.57	2.88	2.56	---	24.2	17.3	58.5	---	100.0	1,468
80	2.84	2.69	2.50	---	49.1	20.4	30.5	---	100.0	15,152
96	3.10	2.74	2.67	---	41.2	25.9	32.8	---	100.0	19,435

1/ Adjusted to correspond to f.o.b. price.
2/ Less than 0.1 percent.

Table 20.--Ruby red grapefruit: Comparison of prices received for f.o.b. and delivered sales made on same day, by container, grade, and size, sample shipping firms, Lower Rio Grande Valley, Tex., 1960-61 season

Container, grade, and size	Number of days on which--		Average price per container for--	
	Both f.o.b and delivered sales made	Price for f.o.b. sales exceeded price for delivered sales 1/	F.o.b. sales	Delivered sales 1/
	Days	Days	Dollars	Dollars
Cartons:				
U.S. No. 1, size--				
54	139	78	4.10	3.03
64	168	99	3.30	3.24
70	124	84	3.02	2.94
80	180	69	2.75	2.96
96	168	79	2.73	2.56
U.S. No. 2, size--				
54	19	12	2.59	2.27
64	36	28	2.78	1.95
70	20	12	2.08	2.26
80	48	31	2.21	2.00
96	123	51	1.97	2.12
Total	1,025	543	---	---
MC 12-5's:				
U.S. No. 1, size--				
54	---	---	---	---
64	2	2	3.13	3.02
70	4	3	3.32	3.00
80	135	53	3.7	3.50
96	108	57	3.24	3.45
U.S. No. 2, size--				
54	---	---	---	---
64	---	---	---	---
70	2	1	3.18	3.04
80	48	33	2.76	2.09
96	59	49	3.12	2.77
Total	358	198	---	---
Grand total	1,383	741	---	---

1/ Adjusted to correspond to f.o.b. prices.

APPENDIX

Theoretical and Statistical Considerations in Relationship of Shipping-Point Margins to Volume

Table 21 shows the effect on shipping-point margins of volume and quality of fruit packed, as estimated by two types of equations, for early oranges, valencia oranges, and ruby red grapefruit. The equations were of two general forms:

$$Y_i = a_i + b_{1i}X_{1i} + b_{2i}X_{2i} \text{ and}$$

$$Y_i = a_i X_{1i}^{b1i} X_{2i}^{b2i}$$

where Y_i = Weekly margin in dollars per box for variety i,

X_{1i} = Quality (percent of U.S. No. 1 Grade) of variety i packed each week,

X_{2i} = Volume (boxes) of variety i shipped each week.

The first type of equation is linear for both variables, while the second type is curvilinear. The coefficients (b values) in the linear equations indicate the effect of a 1-unit change in volume or quality upon margins. The coefficients for the curvilinear equations indicate the effect on margins of a 1-percent change in volume or quality.

There was little difference between the curvilinear and linear forms based on multiple correlation coefficients and significance of b values. Correlations were all reasonabily high and all b values were significant at the 99-percent level. Linearity "explained" as much variation in margins as the more complicated curvilinear form. The curvilinear form did result in a consistent sign on both the quality and volume coefficients.

Multiple correlation coefficients were highest for valencia oranges and early oranges. The short marketing season for valencia and early oranges, compared with ruby red grapefruit, probably helps to account for this.

Comparison of Sales by Variety and Grade

In 1960-61, over 60 percent of the Lower Valley citrus was sold as U.S. No. 1 grade, 26 percent U.S. No. 2 grade, minor amounts were sold as U.S. Combination and U.S. No. 3 grade, and 9 percent was sold as juice (table 22). Data on 24 percent of the citrus sold by the sample firms did not indicate the grade classification. However, it is probable that this citrus would be distributed by grade in the same proportion as citrus of known grade.

The weighted average net f.o.b. price for U.S. No. 1 grade citrus was $3.26 compared to $2.40 for U.S. No. 2 grade and $1.67 for juice citrus (table 23). The premium for U.S. No. 1 over U.S. No. 2 averaged 82 cents on oranges and 83 cents on grapefruit. The season average price for U.S. Combination generally fell between average prices for U.S. No. 1 and 2. Among varieties of oranges, navel oranges averaged to be the highest prices. Ruby red grapefruit and marsh white grapefruit brought the highest prices for grapefruit.

Table 21.--Regression and correlation coefficients, t-values, and degrees of freedom for multiple regression equations, relating shipping-point margin (y) to quality (X_1) and weekly volume shipped (X_2), Lower Rio Grande Valley citrus market, 1960-61 season

Statistical model and commodity	b_c	b_1	b_2	t_1	t_2	R^2	d.f.
$y = a + b_1X_1 + b_2X_2$							
Early oranges.	0.2896	0.08495	-0.00002	19.80**	4.59**	.96	18
Valencias.	.01027	0.02650	0.00001	18.01**	4.48**	.99	14
Ruby red grapefruit.	.02289	0.04255	-0.00001	10.84**	3.01**	.84	36
$y = aX_1^{b_1}X_2^{b_2}$							
Early oranges.	-0.00087	0.72205	-0.17243	10.14**	6.97**	0.96	18
Valencias.	-0.00004	0.63750	-0.18967	24.91**	19.85**	0.99	14
Ruby red grapefruit.	0.00060	0.47182	-0.12269	5.33**	3.75**	0.82	36

Table 22.--Percentage of each variety of citrus sold, by grade, sample shipping firms, Lower Rio Grande Valley, Tex., 1960-61 season

Variety	U.S. No. 1	U.S. combination	U.S. No. 2	U.S. No. 3	Juice	Total	Grade specified	Grade not specified	Total	Percentage of all citrus
	Percent									
Oranges:										
Early oranges	41.9	12.2	16.8	0 3	28.8	100.0	74.5	25.5	100.0	10.3
Valencias	58.9	3.4	26.6	1/	11.1	100.0	82.2	16.8	100.0	10.8
Navels	68.4	11.9	18.3	1.4	1/	100.0	57.0	43.0	100.0	.7
Not specified	36.1	1.1	26.8	.5	35.5	100.0	51.8	48.2	100.0	10.4
Average, all oranges	47.8	6.0	23.2	.2	22.8	100.0	69.7	30.3	100.0	32.2
Grapefruit:										
Ruby red	68.3	2.4	28.3	.2	.8	100.0	81.2	18.8	100.0	51.2
Marsh white	66.6	2.9	29.0	1/	1.5	100.0	80.3	19.7	100.0	7.0
Marsh pink	65.8	2.1	31.4	.5	.2	100.0	66.9	33.1	100.0	2.5
Foster pink	71.8	14.1	14.1	---	---	100.0	95.4	4.6	100.0	1/
Not specified	16.4	1.0	32.9	.4	49.3	100.0	63.1	36.9	100.0	3.8
Average, all grapefruit	65.6	2.4	28.6	.2	3.2	100.0	79.4	20.6	100.0	64.5
Tangerines	97.1	---	1.8	1.1	---	100.0	58.2	41.8	100.0	.3
Miscellaneous citrus:										
Tangelos	---	---	---	---	---	100.0	---	100.0	100.0	1/
Mixed citrus	54.4	19.0	16.9	---	9.7	100.0	80.3	19.7	100.0	.1
Mexican tangerines	91.7	---	8.3	---	---	100.0	63.8	36.2	100.0	1.4
Mexican oranges	98.4	---	.4	---	1.2	100.0	74.3	25.7	100.0	1.1
Not Specified	38.7	---	3.6	---	57.7	100.0	79.2	20.8	100.0	.4
Average, miscellaneous citrus	84.9	.8	4.9	---	9.4	100.0	70.1	29.9	100.0	3.0
Average all citrus	60.9	3.4	26.3	.2	9.2	100.0	76.0	24.0	100.0	100.0

1/ Less than 0.05 percent.

Table 23.--Weighted average net f.o.b. price of citrus sold, by variety and grade, sample shipping firms Lower Rio Grande Valley, Tex., 1960-61

Variety	U.S. No. 1	Comb.	2	3	Juice	Average, all grades 1/
Early oranges	4.05	4.14	3.61	3.63	2.12	3.56
Valencia oranges	4.73	4.49	3.72	3.04	2.21	4.18
Navel oranges	6.02	5.22	4.54	4.04	1.42	5.57
All oranges 1/	4.43	4.26	3.56	3.56	2.05	3.77
Ruby red grapefruit	2.81	2.74	1.98	3.48	.37	2.56
Marsh white grapefruit	2.80	2.25	1.90	2.00	.53	2.47
Marsh pink grapefruit	2.59	3.16	1.87	3.18	.56	2.38
Foster pink grapefruit	1.94	2.07	1.75	--	--	1.89
All grapefruit 1/	2.80	2.68	1.97	3.38	.47	2.49
Tangerines	5.12	--	4.63	6.37	--	5.20
Miscellaneous citrus	4.70	3.06	4.16	--	1.83	4.33
All citrus 1/	3.19	3.50	2.40	3.48	1.67	2.97

1/ Includes data on fruit of unspecified variety and grade.

Method of Choosing Sample Firms

Original data used in this study came from a sample of 14 firms which packed and shipped citrus during the 1960-61 season. These firms were part of a larger stratified random sample chosen to provide information on market structure and performance for the entire Lower Valley fruit and vegetable market. The citrus market was considered to be a subgroup of the entire shipping-point market.

Firms in the larger sample were stratified by the volume (carlot equivalents) of all fruits and vegetables shipped. Number of firms and desired sampling rates for the larger sample are shown in table 24. Because total shipments of each commodity differed, the stratified sample desired for all commodities was not a stratified sample for citrus. The group of 14 citrus shippers from which data were obtained is more generally biased toward the larger volume groups than is the desired sample of all firms. The sample firms handled 78 percent of all citrus shipped in 1960-61 and 73 percent in 1961-62.

The number of sample firms in each size category is shown in table 25.

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Table 24.--Sampling rates for all fruit and vegetable firms, Lower Rio Grande Valley, Tex.

Fruits and vegetables shipped	Total firms	Percentage of total firms chosen	Sampling rate	Number of firms desired in sample	Firms which handled citrus
	Number	Percent	Percent	Number	Number
500 carlots and over....	18	13.95	100	18	10
250 to 499 carlots......	26	20.16	50	13	4
100 to 249 carlots......	24	18.60	50	12	0
10 to 99 carlots........	37	28.68	25	10	0
Less than 10 carlots....	24	18.60	0	0	0

Table 25.--Number of citrus shippers and firms in sample, by volume class, Lower Rio Grande Valley, Tex., 1960-61 season

Volume class 1/	Total citrus shippers	Firms in sample	Percentage of total firms in sample
	Number	Number	Percent
Large..................	7	6	86
Medium.................	7	5	71
Small..................	7	3	43
Smallest...............	17	0	0

1/ Large firms handled 50 percent of total volume; medium, 30 percent; small, 15 percent; and smallest 5 percent.